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By-Greathouse, Larry J.

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Measures of oral language, verbal associative learning, and nonverbal IQ were collected from a mixed unilingual and bilingual random sample of 66 third- and fifth-grade pupils in Las Cruces, New Mexico. Correlational techniques were employed to determine whether, and to what extent, relationships existed between verbal associative learning skill and several measures of oral language. The Cattell Culture Fair Intelligence Test and the Verbal Paired-Associates Test were administered. At both grade levels significant zero order correlations were found between the associative learning measure and the following language measures: mean length of response, mean of the five longest responses, standard deviation of response length, number of different words, and structural complexity score. Standard deviation of response length, the language measure most highly correlated with associative learning, was also significantly correlated with the IQ measure; however, these two measures correlated significantly when IQ was held constant. It was concluded that there is a relationship between oral language development and verbal associative learning. Tables and references are included. (Author/CM)

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ORAL LANGUAGE AND AURAL ASSOCIATIVE LEARNING OF THIRD AND FIFTH GRADE PUPILS*

Larry J. Greathouse, Ed.D.
Assistant Professor of Education
The University of Arkansas

While many changes are taking place in education today, in a fundamental way, the task of the student remains the same. The acquisition of knowledge is primarily a verbal learning process. Associative learning, as Russell explains, has a fundamental role in the verbal learning process.

> Associative thinking is a broad term which includes such theories or constructs as conditioning, S-R bonds, primacy, and reinforcement. With the exception of the study of reinforcement research on this topic has declined from the 1920's but there seems little doubt that the label describes much thinking of a rather routine sort in which simple relationships are established. It may be the most accurate description of children's learning names of letters or a sight vocabulary (Russell, p. 11).

A review of the literature revealed that the single factor having the greatest relation to verbal associative learning was the learner's estimate of how meaningful the material was in terms of associations called forth in the learner by the materials. The measure of associations produced in the learner by the materials is called meaningfulness.

Two extensive reviews (Goss and Nodine, Underwood and Schulz) of paired-associate research report studies describing the relation between paired-associate learning and characteristics of the experimental material. Material characteristics which are highly predictive of learning rate include:

1. Number of associations per subject elicited by each syllable or word
2. Number of subjects in a rating group who report an association for a given syllable or word
3. Acoustic characteristics of word or syllable pronunciations
4. Rated ease of pronouncing a word or syllable
5. Length of verbalization required to describe an item to be learned

Each of the above material characteristics reflects a relationship between material to be learned and some aspect of learner language skill. The experimental evidence suggests a fundamental role for language in associative learning skill.

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*This paper is based on data from a doctor of education dissertation completed in August 1968 under the direction of Dr. Richard P. Williams at New Mexico State University.

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An extensive review of reported research studies, however, failed to disclose any study which investigated directly the relationship between verbalization ability and associative learning skill of elementary school children.

Problem. The purpose of this study was to investigate the extent to which relationships exist between third and fifth-grade pupils' verbal associative learning ability and seven indices of pupil ability to verbalize. The seven indices of pupil verbalization ability considered in relation to Verbal Paired-Associate Test scores were (1) Mean Length of Response, (2) Mean of the Five Longest Responses, (3) Number of One Word Responses, (4) Standard Deviation of Response Length, (5) Number of Different Words, (6) Structural Complexity Score, and (7) the Type/Token Ratio.

Hypotheses. The following hypotheses were tested:

1. There is no significant zero order correlation between the Verbal Paired-Associate Test scores of third or fifth-grade pupils and their scores on any of the seven verbalization measures.

2. First order correlations partialing out the common variation due to intelligence will not be significantly different from zero for third or fifth grade.

3. A coefficient of multiple correlation between Verbal Paired-Associate Test scores and scores on the seven verbalization measures for third or fifth-grade children will not be significantly higher than the highest obtained zero order coefficient.

Limitations of the Study. The study was limited to six elementary schools in the Las Cruces School District Number 2, Las Cruces, New Mexico.

The study was further limited by including only those pupils who (1) had parental consent to participate in the study, (2) had not been identified as having hearing loss by the school screening program, and (3) were able to provide the required language samples. Generalizations based on the results of this investigation are assumed to be valid only when applied to the sample population or comparable student populations.

The Sample. The children in the sample were selected from the Las Cruces School District Number 2. The Spanish-American population of Las Cruces School District Number 2 is approximately 40 percent of the total population. Negro and Indian ethnic groups combined comprise approximately 3 percent of the population.

Las Cruces has a cosmopolitan population of approximately 51,818. The public schools enrolled 15,100 students in the 1967-68 school year.

Students in the Las Cruces Public Schools represent a wide range of socio-economic levels and cultural backgrounds. Although instruction in the public

schools is given in English, many students speak Spanish at home.

Tests Used In The Study.

1. Cattell Culture Fair Intelligence Test, Scale 2, distributed by the Bobbs-Merrill Company, Incorporated (Cattell). This is a group test developed by Raymond B. Cattell using visual perceptual tasks after it was demonstrated that this type of item was free from the verbal skill factor and highly saturated with "g" or general intelligence factor. Test content was geometrical in form rather than pictorial and was thereby free, to a large extent, from cultural bias arising from the investment of different meanings in the same object by different cultures.

2. Measures of oral language development. Seven traditional measures of oral language output were employed in this study. The measures are (1) Mean Length of Response, (2) Mean of the Five Longest Responses, (3) Number of One Word Responses, (4) Standard Deviation of Response Length, (5) Number of Different Words, (6) Structural Complexity Score, and (7) the Type/Token Ratio. These measures have a history of use as indices in normative studies of children's language development and are discussed in detail by McCarthy, Templin, and Winitz.

The measures were computed from oral responses made by the subjects to the Children's Apperception Test Cards (Bellack and Bellack) and other pictures. Three 50-response samples were collected from each child and recorded on tape. Transcriptions were then made from the tapes and used for computing the seven measures. The seven measures named above have been shown to have adequate reliability for individual children ($r = +.85$ to $+1.00$) when computed from three 50-response samples.

Reasons for selections of these measures were (1) traditional acceptance and use by researchers in the field of children's language, (2) freedom of measurement from reading and writing requirements, (3) existence of normative data collected in previous research using the same measures, and (4) research evidence attesting to the adequate measurement reliability.

3. The Verbal Paired-Associates Test. The Verbal Paired-Associate Test consisted of four number-trigram pairs presented aurally. Two trigrams (YUQ, ZOJ) had a mean PR rating of 6.62 which represented low pronunciability and two trigrams (BAL, FEN) had a mean PR rating of 2.25 which represented high pronunciability according to Underwood and Schulz's rating.

The trigrams were paired with digits 2 through 5 and presented in four random orders. The learning task was presented in alternating study and test sequences. During study sequences, the subject heard the number-trigram pairs presented. During test sequences, the subject heard the numbers presented and attempted to spell orally the trigrams paired with each number. Twenty study and twenty test sequences were presented. Each subject's score was the number of times the correct trigram was spelled upon presentation of the corresponding number. Perfect scores on two consecutive test sequences terminated the test and credit was given for remaining test sequences.

A presentation rate of 4 seconds/4 seconds was used. An interval of 4 seconds was allowed from the onset of number presentation to onset of trigram presentation. An interval of 4 seconds was allowed between onset of trigram presentation and presentation of the next number. On test sequences the subject was allowed 4 seconds to respond to each number presentation. Timing was accomplished by having the number-trigram pairs read onto magnetic tape with intervals timed by a metronome. Test instructions preceded the test on the tape, and, at the end of each sequence, the subject was advised whether the next sequence would be study or test.

Perfect score for the test was 80 (4 pairs x 20 presentations). Pupil score was the number of pairs correctly completed during test trials plus the number of pairs not presented for which credit was given. The test was administered individually and subject responses were recorded on a prepared record sheet.

A pilot study of the test was conducted with second and sixth-grade pupils. A chi-square test of mormality was made of both second and sixth-grade score distributions. Neither distribution was significantly different from normal. The total test score discriminated between grade levels, $p < .01$, one-tailed test (Garrett).

4. Informal screening to identify Spanish-speaking children was carried out by Spanish-speaking public school personnel. Criterion for Spanish-speaking designation was the ability to engage in conversation concerning school, home, or neighborhood.

Procedures. In April 1968, a random sample of the Las Cruces District's 17 elementary schools was drawn to select six schools for this study. From the six schools assigned to the sample, thirty-five subjects were randomly selected from the third-grade enrollment and thirty-five subjects were randomly selected from the fifth-grade enrollment.

During the last eight weeks of the second school term, 1967-1968, the experimental data were collected. Of the thirty-five third-grade subjects originally selected, two were not given parental permission to participate and one was unable to supply the required language samples. Third-grade data were collected from thirty-two subjects. Of the thirty-five fifth-grade subjects originally selected, one was not able to supply the required language samples. Fifth-grade data were collected from thirty-four subjects. No subjects were identified by the public school auditory screening program as having defective hearing.

All testing was done by the experimenter and one assistant. Three separate individual sessions were scheduled with each subject.

One group testing session was scheduled at each of the six elementary schools involved in the study. During this group session, both third and fifth-grade pupils were administered the Cattell Culture Fair Intelligence Test.

Tests used in the study were handscored and typewritten transcriptions were made from the tape-recorded language samples. The transcriptions were analyzed

and the seven verbalization scores were computed. The collected data were processed by the Statistical Laboratory at New Mexico State University.

Statistical treatment of the data was accomplished primarily with the IBM "Stepwise Linear Regression" (IBM 1130 Statistical Systems) statistical program on the IBM 1130 computer at the Computer Center at New Mexico State University. The "Stepwise Linear Regression" statistical program calculated zero order coefficients of correlation and coefficients of multiple correlation. First order coefficients of partial correlation and t ratios were manually calculated by the experimenter.

The .05 level of probability was set as the point for rejecting the null hypothesis that the coefficient of correlation was not significantly different from zero. The .05 level was also set for accepting additions to the coefficient of multiple correlation as real and not due to chance. For additional interpretation of correlations, the .01 level was also reported.

Results. Third-grade zero order correlations are presented in Table I.

TABLE I

THIRD-GRADE ZERO ORDER CORRELATIONS BETWEEN VERBAL PAIRED-ASSOCIATE TEST SCORES AND SEVEN VERBALIZATION MEASURES

Variables	PA	MLR	M5LR	SDRL	NDW	SCS	N1WR	T/TR
I.Q.	.38*	.49*	.43*	.41*	.51**	.39*	.04	.04
PA		.49**	.65**	.67**	.55**	.48**	-.13	-.17
MLR			.77**	.71**	.66**	.52**	-.10	-.22
M5LR				.98**	.86**	.72**	.03	-.29
SDRL					.84**	.67**	.12	-.25
NDW						.74**	-.07	.04
SCS							-.29	-.47**
N1WR								.20

N = 32 30 degrees of freedom
*Indicates significance at the .05 level, required r = .35.
**Indicates significance at the .01 level, required r = .45.

Inspection of Table I reveals that PA Test scores are significantly correlated with several of the language measures and with I.Q. which is also significantly correlated with several language measures. The first hypothesis was rejected at third grade.

The relationship between PA and language could be due to mutual relationship with I.Q. Table II presents partial correlations between PA and the language measures with the effects of I.Q. held constant. Inspection of Table II indicates that the relationship between PA and language is not due to a mutual relationship with I.Q. The second hypothesis was rejected at third grade.

Table III presents third grade multiple correlations. Standard Deviation of Response Length was the first variable entered in regression equation. The resulting correlation of R = .67 was significant at the .05 level of confidence. The addition of other variables did not produce a significant increase in the coefficient of multiple correlation. The third hypothesis could not be rejected at third grade.

Number designation of factors presented in partial and multiple correlation tables are:

1 - Verbal Paired-Associate Test scores
2 - I.Q.
3 - Mean Length of Response
4 - Mean of the Five Longest Responses
5 - Number of One Word Responses
6 - Standard Deviation of Response Length
7 - Number of Different Words
8 - Structural Complexity Score
9 - Type/Token Ratio

TABLE II

THIRD-GRADE PARTIAL CORRELATIONS

$r_{13.2} = .383^{*}$	$r_{16.2} = .611^{**}$
$r_{14.2} = .579^{**}$	$r_{17.2} = .454^{*}$
$r_{15.2} = -.159$	$r_{18.2} = .396^{*}$
$r_{19.2} = -.198$	

N = 32 29 degrees of freedom
*Indicates significance at the .05 level, required r = .355.
**Indicates significance at the .01 level, required r = .456.

TABLE III

THIRD-GRADE MULTIPLE CORRELATIONS

Variables	F of Addition	R	F_R	df	F required at .05
1(6)	25.36	.67	24.54	1,30	4.17
1(56)	2.63	.70	14.17	2,29	3.33
1(456)	2.64	.73	10.80	3,28	2.95
1(2456)	1.39	.74	8.54	4,27	2.73
1(72456)	.25	.75	6.68	5,26	2.59
1(972456)	.15	.75	5.41	6,25	2.49
1(8972456)	.12	.75	4.49	7,24	2.43
1(38972456)	.02	.75	3.77	8,23	2.38

TABLE IV

FIFTH-GRADE ZERO ORDER CORRELATIONS BETWEEN
VERBAL PAIRED-ASSOCIATE TEST SCORES
AND SEVEN VERBALIZATION MEASURES

Variables	PA	MLR	M5LR	SDRL	NDW	SCS	N1WR	T/TR
I.Q.	.40*	.18	.29	.39*	.30	.13	.28	.19
PA		.51**	.61**	.63**	.43*	.43*	.12	-.14
MLR			.92**	.81**	.76**	.82**	-.16	-.33
M5LR				.97**	.77**	.72**	.07	-.20
SDRL					.75**	.60**	.21	-.08
NDW						.63**	.11	.36*
SCS							-.24	-.28
N1WR								.40*

N = 34 32 degrees of freedom
*Indicates significance at the .05 level, required r = .34.
**Indicates significance at the .01 level, required r = .44.

Inspection of Table IV reveals that PA Test scores are significantly correlated with several of the language measures and with I.Q. which is also significantly correlated with several language measures. The first hypothesis was rejected at fifth grade.

The relationship between PA and the language measures could be due to a mutual relationship with I.Q. Table V presents partial correlations between PA and the language measures with the effects of I.Q. held constant. Inspection of Table V indicates that the relationship between PA and language is not due to a mutual relationship with I.Q. The second hypothesis was rejected at fifth grade.

Table VI presents fifth grade multiple correlations. Standard Deviation of Response Length was the first variable entered into the regression equation and the resulting coefficient of multiple correlation of R = .63 is significant beyond the .05 level of confidence. The addition of other variables did not produce a significant increase in the coefficient of multiple correlation. Therefore, the third hypothesis could not be rejected at fifth grade.

TABLE V

FIFTH-GRADE PARTIAL CORRELATIONS

$r_{13.2} = .490^{**}$	$r_{16.2} = .560^{**}$
$r_{14.2} = .564^{*}$	$r_{17.2} = .352^{*}$
$r_{15.2} = .012$	$r_{18.2} = .415$
$r_{19.2} = -.241$	

N = 34 31 degrees of freedom
*Indicates significance at the .05 level, required r = .344.
**Indicates significance at the .01 level, required r = .443.

TABLE VI

FIFTH-GRADE MULTIPLE CORRELATIONS

Variables	F of Addition	R	F_R	df	F required at .05
1(6)	21.73	.63	21.73	1,32	4.14
1(26)	1.60	.65	11.49	2,31	3.31
1(926)	1.03	.67	7.99	3,30	2.92
1(8926)	.18	.67	5.87	4,29	2.70
1(38926)	.24	.67	4.62	5,28	2.56
1(738926)	.83	.68	3.95	6,27	2.46
1(4738926)	.13	.69	3.30	7,26	2.40
1(54738926)	.04	.69	2.78	8,25	2.16

Summary and Conclusions. Measures of oral language, verbal associative learning, and nonverbal I.Q. were collected from a mixed unilingual and bilingual random sample of third and fifth-grade pupils. Correlational techniques were employed to determine whether, and to what extent, relationships existed between verbal associative learning skill and several measures of oral language.

The pattern of correlation was similar at third and fifth-grade levels. At both grade levels significant zero order correlations were found between the associative learning measure and five language measures. Standard Deviation of Response Length, the language measure most highly correlated with associative learning, was also significantly correlated with the I.Q. measure at both grade levels. However, the correlations between associative learning scores and Standard Deviation of Response Length were significant at the .01 level with the effects of I.Q. held constant. Because of the high intercorrelations between the language measures, multiple correlations were not greater than the zero order correlations between Standard Deviation of Response Length and associative learning scores at third and fifth-grade levels.

The results of the study were interpreted as evidence that a relationship does exist between oral language development and verbal associative learning skill of third and fifth-grade unilingual and bilingual pupils.

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